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ABSTRACT

The problem of planning and making labor market forecasts by occupation and qualification in the context of a constantly changing labor market was examined. The examination focused on the following topics: assumptions, benefits, and pitfalls of the labor requirement model of projecting future imbalances between labor supply and demand for certain types of education or qualifications; considerations in interpreting educational and skill requirements for specific jobs; substitution processes resulting from discrepancies between demand and supply in the labor market; substitution processes in the labor market (opportunities to switch to jobs in other economic subsectors, opportunities for substitution in recruiting personnel, structure of the labor market, clearly demarcated market segments, large occupational submarkets, specialization and flexibility, and similarities between different levels of education); methods of modeling substitution processes; components of demand; and shifts in employment by educational levels. It was demonstrated by way of the example of the Dutch labor market that substitution processes between different types of education play a crucial role in the labor market's adjustment to changes in supply and demand. (Contains 14 references and 15 tables/figures. A summary of this paper that was presented at a 1995 conference is appended.) (MN)

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European Centre for the Development of Vocational Training

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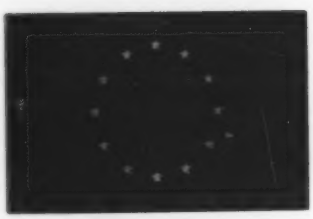

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Summary

1 Introduction

The labour market is constantly changing. Sectors of industry grow while others are shrinking. Some occupations become relatively more important while others decrease in importance, and employers tend to change the requirements for qualifications to fulfil these occupations. On the other side of the labour market the supply of workers with a certain qualification limits the recruitment possibilities for employers. On the labour market, therefore, matching processes take place which bring together supply and demand, which constantly have to adjust to the changing circumstances.

The last decades there have been several tendencies which raised the need to forecast trends in occupations and qualifications. First of all, an adequate education has become an important factor in economic production. More and more not only the level, but also the direction of a training is relevant for both individual and social reasons.

Secondly, the large individual and governemental investments in the educational system ask for a careful consideration of the way in which resources and utilized. For optimal decisions at individual and policy level, adequate information is needed which anticipates future trends in supply and demand for certain qualifications.

The most prominent method to deal with the projection of future imbalances between supply and demand for certain types of education, or qualifications, is the so-called manpower requirement approach. In the manpower requirement approach typically forecasts are made of the future labour market situation of types of education, in which demand and supply are forecasted independently. The basic assumption of this approach is that the demand (or requirement) for labour of a certain type of education can be recognised as such in a sensible way. Both forecasts — requirements and supply — are compared and if the supply does not match the requirements, labour market problems are predicted. This comparison leads to a surplus or to a shortage, and these are, in the pure requirement approach, regarded as discrepancies which have to be bridged by an adequate policy, because in case of a surplus educational resources are inefficiently used and in case of a shortage economic goals cannot be attained. In case of an adequate policy these gaps — in case they were predicted — will therefore not be observed afterwards.

The original aim of the manpower requirement model has been an instrument for educational planning.[1] If, as in a market system, the government has no significant role in the educational decisions of students, the forecasts of the educational structure of the future labour market might, nevertheless, be important. The forecasts can be used as public information which is relevant for students. Borghans (1993) shows that the provision of labour market forecasts to students may improve their educational choice, and therefore reduce the mismatch between supply and demand. In such a situation it is not guaranteed anymore that students' choices will automatically adjust to information about a gap between supply and demand such that the expected gap will disappear. In this market based framework students will not directly change their behaviour because of the existence of a gap between supply and demand, but discrepancies at the market will affect the market position of different types of education (e.g. changes in the wages, job levels, or in the level of unemployment). These changes in the market position, might, if correctly anticipated, affect students' behaviour. In a more pragmatic view the gaps, predicted by the manpower requirement approach, are therefore regarded as indicators for the future labour market

1. Hughes ( ) and Van Eijs () give an overview of the manpower forecasting literature

position of the types of education; a position that could be manifested in various ways.

In the market framework, furthermore, it might be questioned what is the meaning of a requirement. In a market the optimal situation, i.e. a situation without mismatch,[2] is a situation in which supply, represented by the preferences and capabilities of the students, and demand, represented by the production possibilities of employers, are optimally balanced. The implicit aim in a market context therefore is not a demand side production target, but is implicitly constructed by both supply and demand side characteristics.

Furthermore, in actual practice there often is for the fulfilment of a specific job, a large scope for substitution between workers with a different educational background. There usually is not a one-to-one relationship between education and occupation as is (implicitly) assumed in a basic manpower planning model. Workers with a specific educational background have the opportunity to switch to different occupations, while employers have the flexibility to recruit workers with different educational backgrounds.

From this market point of view the approach of predicting surpluses and shortages for educational types in the usual manpower requirement approach has several, closely connected, shortcomings. Firstly, the prediction of a surplus or shortage is, as remarked above, an abstract theoretical construct. In actual practice a shortage as such will not necessarily be noticed. Surpluses are possibly observed by increasing unemployment, lower wages, or people changing to lower level jobs. Shortages might manifest themselves in difficulties to fill vacancies, higher wages, or the hiring of people for certain jobs with a less appropriate education. The labour market has a some flexibility to react on discrepancies between required and offered qualifications.

A second shortcoming of the requirement approach is that it does not take into account the fact that surpluses or shortages for one type of education influence the labour market situation of other types. For some types of education (e.g. higher education) surpluses do, mainly, not lead to unemployment, but result in crowding-out processes. The higher educated get jobs at a lower level and therefore the demand for people at the intermediate level decreases. The usual independent projections of supply and demand do not take into account these substitution effects.

A third disadvantage of the straight surplus/shortage forecasts is that, due to the hypothetical character, it is not possible to make straightforward evaluations of the forecasts. The model only predicts the hypothetical gap between supply and demand, which can not be measured directly. Ex post measurement requires additional forecasts about what will happen with the shortage or the surplus. They provide no direct information about the 'requirements' itself.

The most important consequences of this is that trends in employment actually observed do not necessarily directly reflext underlying trends in the need for certain qualifications, but are also the results of adjustment processes on the labour market.

To make right interpretations of the actual trends in occupations and qualification requirements, but also in order to be able to make appropriate forecasts of these trends, it is therefore important to develop tools which provide insight in these developments. This paper gives an overview of the approach used by the Research Centre for Education and the Labour Market to cope with these problems. This approach

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2 See Borghans (1993, chapter 2).

consists of, on the one hand, a method to measure similarities or overlaps in occupational domains between types of education, and, on the other hand, an explicit model of substitution processes which occur due to demand-supply imbalances. The paper both deals with the theoretical framework of this approach and provides empirical examples obtained from the recent forecast for the Dutch labour market till the year 2000.

The next chapter will investigate the problem of interpreting trends in required qualifications, in the context of a flexible labour market. In chapter 3 the structure of the Dutch labour market is decribed, in which the main point of attention is on the flexibility of the market. Chapter 4 discusses the *Manpower Requirement Model with Substitution*, developed by the ROA while in chapter 5 empirical results of the earlier mentioned forecasts provide an example of this approach. Finally in chapter 6, we will discuss the possibilities these models provide to obtain more information about trends in required qualifications and occupations, but also will mention some important research questions. These questions point to future theoretical research which seems to be very relevant for the improvement of the insight we have in tendencies at the labour market. Such investigations might further improve the transparancy of the labour market developments and therefore improve decisions both at individual and policy level.

2 The interpretation of requirements

As mentioned in the introduction, the traditional manpower planning models depart from the assumption that every occupation requires certain qualifications. Implicitly in this approach is the thought that more qualifications do not contribute to the fulfilment of the job, while less qualifications imply a serious shortcoming in the functioning of the person involved in this job (see Blaug, 1967).

Opposed to this, an obvious conclusion from the fact that in actual practise the match between occupation and qualification shows some flexibility, is that requirements for a specific job are not exogeneously to the labour market, but are the outcome of the allocation process on the labour market. The match between supply and demand is not only determined by the needed qualifications but will also be regulated by the balance of supply and demand. The possibilities to recruit somebody with a certain qualification and the costs of recruitment (both searching costs and wages) influence employers decision who to employ for a certain occupation. This means that if a certain group of workers becomes more scarce, employers will be forced to provide better working conditions for these people or to switch their recruitment to other groups on the labour market. The demand for one group of workers might therefore be caused by the shortages of others.

This view on the functioning of the labour market, which will be empirically illustrated in the next chapter, seems at first sight to contradict the traditional manpower planning model in which the demand for each occupation is confronted with the supply from certain educational categories. In some recent papers (Borghans and Heijke, 1996, Wieling and Borghans, 1995 and Borghans and Willems, 1995) it has been shown however that also from the view point of a flexible labour market, manpower requirement projections may provide very useful information.

Figure 2.1
An increase in employment due to an increase in demand

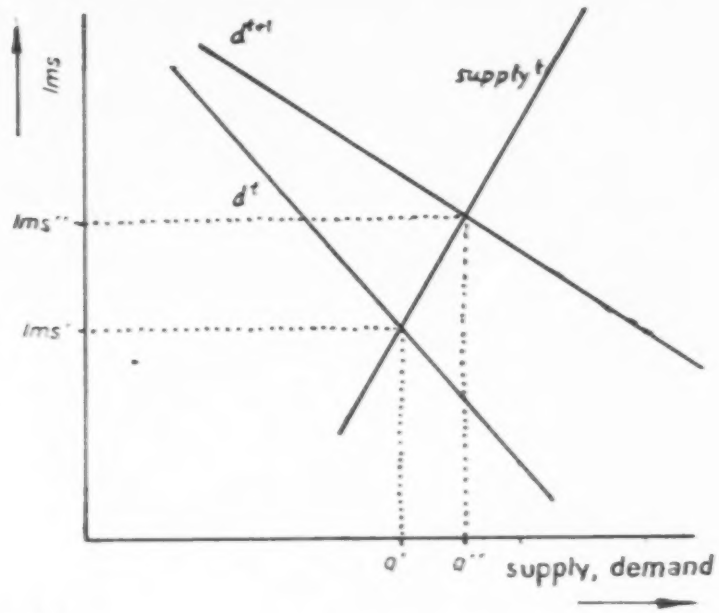

Figure 2.2
An increase in employment due to an increase in supply

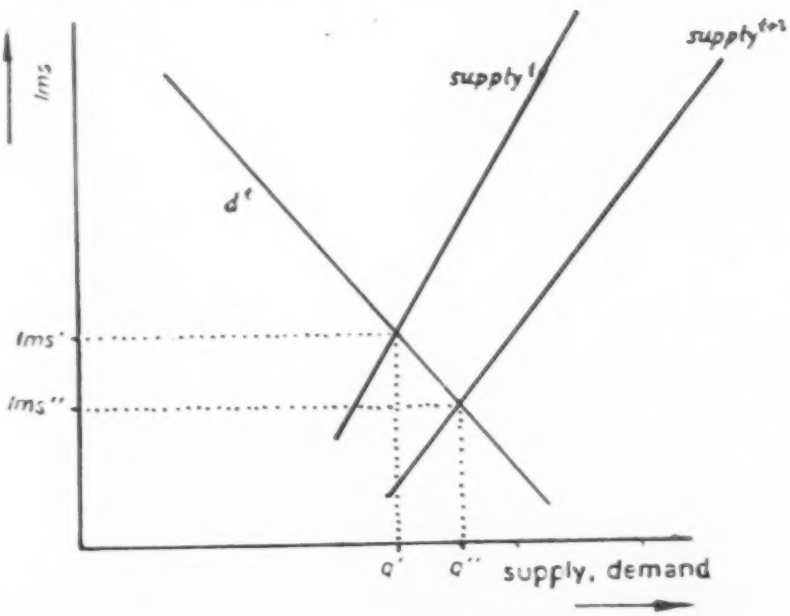

Figure 2.1 and 2.2 show that a naive interpretation of the data might provide wrong conclusions about the trends occuring at the labour market. Both figures provide the supply and demand curves of a segment of the labour market. At the vertical axes the labour market situation (*lms*) is depicted. This labour market situation might include besides wages also non-pecuniary aspects of the labour contract.

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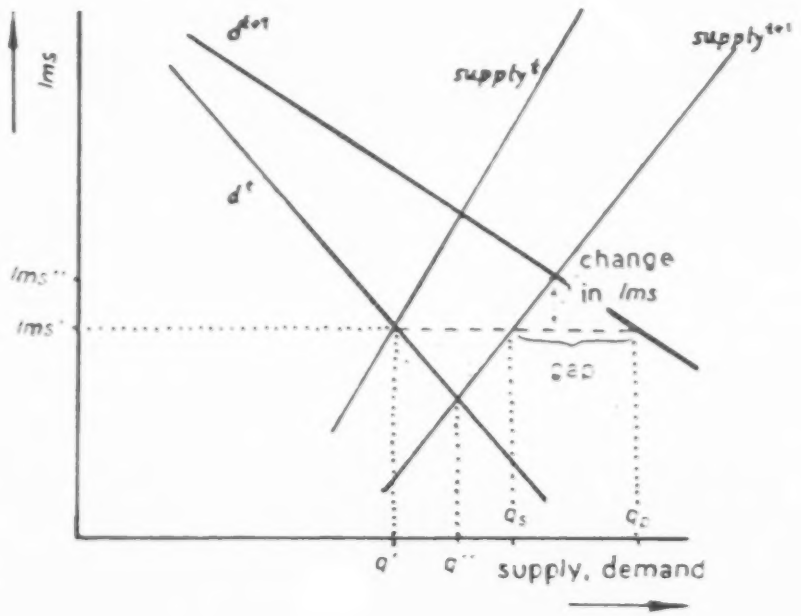
In figure 2.1 there occurs an exogenous shift of demand. Demand goes up and therefore more people are recruited which leads to shortages. For that reason the labour market situation of this category of workers improves towards lms", while the employment within this occupation increases. In figure 2.2 in opposition to this, there is an increase in supply. This leads to a surplus of workers what will worsen the labour market position of this group towards lms"'. It becomes therefore more attractive to employ people from this category, so also in this case employment goes up.

This leads to different situations, both in which employment increases. If the rise in employment is due to an increase in demand. It implies an improvement of the labour market situation of the group involved, whereas in case of a supply shift the labour market situation of the group involved worsened.

A labour force survey or population census, which is typically used for a manpower requirement analysis, provides however only information about the number of people from each educational category working in an occupation. It often gives no information about wages and other relevant aspects of the labour market position. As figure 2.1 and 2.2 show, it is however crucial to interpret the underlying causes of employment shifts in order to be able to conclude about the labour market prospects of certain categories of labour.

It can be shown that a careful chosen definition of supply and demand for specific categories of labour provides figures of the discrepancy betweem supply and demand (surplusses or shortages) which are far more useful for interpreting labour market development, than the employment developments themselves. This brings us back to the manpower requirement analysis. If the definition of supply and demand is chosen appropriately these discrepancies between supply and demand can provide useful information about labour market developments.

Figure 2.3
Supply and demand in a segment of the labour market and the gap between requirement and supply



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requirement model, if adjustment mechanisms are assumed to exist. In a flexible framework as shown in the figures, it is not possible to speak of supply and demand per se. The quality of labour actually supplied and demanded on the labour market always have to be interpreted given certain market conditions, which are, in the figures, denoted by the labour market situation, *lms*.

Figure 2.3 provides an interpretation of what is actually being predicted when manpower requirements are forecasted. In the figure again a supply and demand curve are depicted for the market of one specific type of education in one specific occupation. There is an equilibrium between supply and demand.

The labour market situation, which equilibriates supply and demand, determines the appropriate allocation of labour, i.e. the distribution of jobs that fit to a certain type of education depends on the labour market situation. If a forecast of the future requirements has to be made which can be used to measure the discrepancy between supply and demand and which can be viewed upon as a measure of the tension at the market, it is not useful to forecast the demand in the new equilibrium situation. In this new equilibrium (q") demand will equal supply again since adjustments due to the tension have already occured. It is therefore more informative to forecast supply and demand as if the labour market situation does not change. In that case a gap between supply and demand will appear (q_D - q_S). This gap is very informative about the future labour market situation of a type of education since — keeping the elasticities of supply and demand constant — the gap is proportional to the change in labour market situation (*lms"* - *lms'*). The discrepancy between supply and demand is therefore a good indicator of expected changes in the labour market situation. Even if the market mechanism works, discrepancies between supply and demand at labour market conditions in a certain basic situation provide insight in changes in the labour market situation of the category involved.

3 Substitution processes on the labour market

3.1 Introduction

Although the various types of education, particularly those in vocational education, focus on specific labour market segments, in practice there are almost no exclusive relationships between particular types of education and particular occupations or economic sectors. People with the same education find work in various occupations and economic sectors, and many occupations can be practised by personnel with a variety of educational backgrounds. And even where a particular occupation can only be practised by those with a specific diploma, this does not mean that those who have this type of education can only find work in that occupation.

Although it is thus not possible to identify a separate occupational domain for each type of education, the labour market does seem to have a reasonably clear structure when differentiated by types of education. Nevertheless, the overlap between the occupational domains makes it possible for both those seeking labour and those offering their labour to adjust their requirements according to changes in the relationship between demand and supply in the labour market.

This chapter will examine this structure of the Dutch labour market in more detail, to provide a better understanding of the possible substitution processes which take place as a result of discrepancies between demand and supply in the labour market. It will begin by examining the opportunities to switch between labour market domains: on the supply side this refers to the breadth of the occupational domain in which those with a particular educational background can find work. For the employers, switching

opportunities refer to the flexibility which they have to recruit people with another educational background for a specific occupation. These analyses will be followed by an examination of the structure of the Dutch labour market, as regards the overlap between the occupational domains of the various types of education. Consideration will then be given to the clearly demarcated labour market segments; to the segments which are the most important destinations for those switching from their 'own' occupation; to the specialisation and flexibility of various types of education as regards the labour market; and to the relationship between education in comparable fields but at differing educational levels.

3.2 Opportunities to switch within the labour market

The choice of a particular type of education always entails a certain risk. Every course is intended to some extent to impart specific skills, which are required for particular occupations but not for other occupations. Because taking a course always requires a considerable investment of time, and a person's educational background has a large influence on their labour market opportunities, often for a long time, pupils and students always run the risk that labour market developments will not turn out as expected. Moreover, in the course of their study or working life they gain more insight into their own capacities and preferences, so that the occupational opportunities which had at first seemed appealing later lose their attraction.

Thus a type of education which offers graduates the chance to switch to many occupations and economic sectors will be attractive, and to the extent that graduates do work in a particular occupation, it is advantageous if employment for the occupation is spread over several economic sectors, so that they are at least not dependent on employment levels in a particular economic sector. Thus wide opportunities to switch to other sectors of the labour market will, on its own, improve the market position of workers. The drawback is that types of education which are intended to be relevant to a broad segment of the labour market will be less able to concentrate on the specific skills which each of the occupations demands. The need to acquire professional or craft skills therefore limits the extent to which a curriculum can be made more flexible. Many courses, especially for occupations which require very specific skills, such as the medical technical or military professions, will necessarily have to remain specialized.

Opportunities to switch to other economic sub-sectors

The types of education with few, and with many, opportunities to switch to a variety of economic sub-sectors are shown in table 3.1. These opportunities to switch are measured using the 'Gini-Hirschman indicator' (GH, see De Grip, Borghans and Willems, 1995). This indicator — which is based on the probability that two people with the same educational background will be working in the same economic sub-sector or occupational group — has a minimum value of 0, if a particular educational background leads to employment in only one economic sub-sector or occupational group, and comes closer to 1 the more evenly the employment is spread.

In practice it is only the vocational training courses for 'non-commercial services' which offer very low opportunities to switch to other economic sub-sectors, so that these graduates are almost entirely dependent on the level of employment in the collective sector. This applies to medical education of various types, teachers' training, the training for the police, fire and defence forces at intermediate and higher levels, and *IVE Administrative, Legal and Fiscal*. J The IVE and apprenticeship courses in printing technology also offer low opportunities to switch between economic sub-sectors.

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Workers without any educational qualifications and those with only [3]LGSE seem to be scattered most widely over various economic sub-sectors. Commerce subjects at IVE or apprenticeship level and at HVE level seem to offer many opportunities to switch to various economic sub-sectors. It is striking that there are also a number of technical disciples at PVE and IVE or apprenticeship levels which have equally low levels of dependence on the changing employment levels in a few economic sub-sectors.

Table 3.1
Types of education with few or many opportunities to switch to various economic sub-sectors

Type of education	GH	characterization
Few opportunities to switch		
UE, veterinary and medical sciences and dentistry	0.41	very low
HVE nursing and paramedical	0.45	very low
IVE/app. nursing and medical assistant	0.49	very low
IVE administrative, legal and fiscal	0.52	very low
HVE medical laboratory	0.52	very low
HVE teachers' training	0.56	very low
HVE police, fire and defense forces	0.57	very low
IVE police, fire and defense forces	0.60	low
UE theology	0.65	low
IVE/app. printing technology	0.67	low
Many opportunities to switch		
Primary education	0.98	very high
Junior General Secondary Education	0.98	very high
PVE commerce and administration	0.97	very high
IVE/app. mechanics	0.97	very high
PVE mechanical technology	0.97	very high
HVE commerce and administration	0.97	very high
Senior General Secondary Education	0.97	very high
PVE electronic technology	0.96	very high
IVE/app. commerce and administration	0.96	very high
IVE/app. micro-mechanical technology	0.96	very high

Source: ROA

Table 3.2 provides an overview of the occupational classes in which workers have few, or many, opportunities to switch to different economic sub-sectors. A large number of medical and para-medical occupations are very susceptible to changing employment levels in the medical sector, while *military professionals, hairdressers and beauticians, managers in agriculture, plasterers and bricklayers, bakers, senior civil servants* and *primary and special education teachers* have few opportunities to switch to other economic sub-sectors.

In contrast, employment for more service-oriented occupational classes such as *administrators and bank employees, secretaries and typists* and *telephonists, receptionists and pollsters* is spread broadly over economic sub-sectors. The same is true for a number of more technical occupational classes such as *instrument makers and maintenance engineers* and *forklift drivers*. Naturally the management occupations are also found in many economic sub-sectors.

3. The abbreviations used for school levels are the following:
   - PVE Preparatory Vocational Education
   - JGSE Junior General Secondary Education
   - IVE Intermediate Vocational Education
   - app. Apprenticeship
   - SGSE Senior General Secondary Education
   - HVE Higher Vocational Education
   - UE University Education

Table 3.2
Occupational classes with few, or many, opportunities to switch to other economic sub-sectors

Occupational class	GH	characterization
Few opportunities to switch		
Military professionals	0.00	very low
Hairdressers and beauticians	0.06	very low
Doctors', dentists', and vetinary assistants	0.06	very low
Managers in agriculture	0.10	very low
Plasterers and bricklayers	0.18	very low
Physiotherapists and occupational therapists	0.19	very low
Vetinary surgeons	0.19	very low
Bakers and chocolate makers	0.20	very low
Senior civil servants	0.20	very low
Primary and special education teachers	0.20	very low
Many opportunities to switch		
Instrument makers and maintenance engineers	0.97	very high
Senior finance and sales managers	0.97	very high
Entrepreneurs, executives and business experts	0.97	very high
Forklift drivers	0.97	very high
Freight handlers	0.95	very high
Receptionists, telephonists and pollsters	0.94	very high
Mechanics	0.94	very high
Branch managers, purchasers and commercial representatives	0.94	very high
Secretaries and typists	0.92	very high
Administrators and bank employees	0.92	very high

Source: ROA

Opportunities to switch to other occupational groups

Table 3.3 gives an overview of the types of education which offer few, or many, opportunities to switch to other occupational groups. In this case only the opportunities to switch to occupations at the same or higher function level have been considered. Nine types of education offer very many opportunities to switch to other occupational groups.

Only five types of education offer very few opportunities to switch to other occupational groups. Those with medical training at university level have the most limited opportunities to switch to other occupations, and also the smallest opportunities to switch to other economic sub-sectors. It is striking that there are also few opportunities to switch for those with *HVE business information technology* and *PVE utilities installation*. In fact, *PVE utilities installation* is one of the few fields of technical training with only limited opportunities to switch.

In addition to those from the various types of education within general secondary education, and those with no school qualifications, the list of those with many opportunities to switch within the labour market also includes a number of commercial studies and, strikingly, also a number of technical courses. These are mainly types of education at PVE and IVE or apprenticeship level. Only training in mechanics offers many opportunities to switch at both the IVE or apprenticeship and HVE levels. Because the technical types of education are focused on particular trades, one would expect that these types of education would offer only limited opportunities to switch to other occupational groups. But in fact most technical types of education do not seem to offer more limited opportunities to switch than other types of education. This is because, although technical types of education do focus on a specific occupational domain in a technological field, they give access to a broad spectrum of occupations outside their technical occupational domain (Borghans, De Grip and Smits, 1995). Because as many as 40% of all

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technically trained persons work in a non-technical occupation, these occupations offer those with technical training a broad field to which they can have recourse. In the light of the high sensitivity of employment in many technical occupations to the state of the business cycle (see section 3.4) this flexibility is very valuable.

Table 3.3
Types of education with few, or many, opportunities to switch to other occupational classes

Type of education	GH	characterization
Few opportunities to switch		
UE veterinary and medical sciences and dentistry	0.51	very low
UE theology	0.57	very low
HVE business administration technology	0.59	very low
UE pharmacy	0.60	very low
PVE utilities installation	0.63	very low
IVE/app. secretarial	0.64	low
UE computer science	0.64	low
IVE technical laboratory	0.65	low
IVE/app. commerce and administration	0.71	low
HVE medical laboratory	0.72	low
Many opportunities to switch		
Primary education	0.98	very high
PVE mechanical technology	0.97	very high
IVE/app. commerce and administration	0.96	very high
PVE transport and harbour	0.96	very high
HVE mechanics	0.95	very high
IVE/app. mechanics	0.95	very high
SGSE	0.95	very high
JGSE	0.95	very high
IVE/app. textile and leather technology	0.95	very high
PVE commerce and administration	0.95	high

Source: ROA

Opportunities for substitution in recruiting personnel

Just as it is favourable for those offering labour not to be dependent on the demand for labour in a specific economic sub-sector or occupational group, it is in principle attractive for employers not to be dependent on the supply of labour with a particular educational background when recruiting workers for a particular occupation. If workers with one type of education are in short supply they can then recruit personnel from another educational background without having to undertake appreciable additional training. Table 3.4 gives an overview of the occupational classes in which employers have few, or many, possibilities for substituting employees with various types of education. As might be expected, the typical non-commercial service occupations dominate the list of occupational classes in which employers are strongly dependent on the supply of labour with specific training for that occupation. Comparing the coefficients of dispersion in table 3.4 with those in table 3.3, it can be seen that for occupations in non-commercial services the dependence of employers on a specific type of education is considerably greater than the dependence of those with training for non-commercial services on the specific occupational field for which they have trained.

Table 3.4
Occupational classes in which employers have few, or many, opportunities to substitute workers with alternative educational backgrounds

Occupational class	GH	characterization
Few opportunities for substitution		
Dentists and dental specialists	0.04	very low
Vetinary surgeons	0.04	very low
Physicians, medical specialists and pharmacists	0.31	very low
Primary and special education teachers	0.33	very low
Pharmacy assistants, opticians and orthopaedists	0.35	very low
Physiotherapists and occupational therapists	0.45	very low
Legal professionals	0.47	very low
Registered nurses, district nurses and midwives	0.59	very low
Pastoral vocations	0.61	low
Hairdressers and beauticians	0.66	low
Many opportunities for substitution		
Entrepreneurs, executives and business experts	0.98	very high
Senior finance and sales managers	0.97	very high
Technical and medical representatives	0.96	very high
Housekeeping consultants	0.96	very high
Secondary and tertiary education teachers	0.95	very high
Senior civil servants	0.95	very high
Administrative supervisors	0.95	very high
Dispatch workers and administrative personnel	0.95	high
Receptionists, telephonists and pollsters	0.94	high
Journalists, authors and announcers	0.94	high

Source: ROA

The list of occupational classes which offer employers many opportunities for substitution is dominated by a number of typical management occupations and the *senior civil servants*. For these occupations, the specific educational background of the workers is apparently not so important. Apparently employers can recruit *housekeeping consultants* and *technical and medical representatives* from a broad field. The unexpectedly large opportunities for substitution in recruiting *secondary and tertiary education teachers* are due largely to a statistical distortion, because in the classification system which has been used it has not been possible to distinguish between the various subjects which teachers teach. In fact each type of education trains largely teachers for one particular subject.

3.3 The structure of the labour market

Because workers with a particular educational background can switch to several occupations, and employers can recruit personnel with diverse educational backgrounds for a particular occupation, there may be an overlap in the labour market between the occupational domains of types of education. This overlap is represented here in the form of a *competition index* for each pair of educational types. The closer the value of this index is to 1, the greater are the similarities in the occupational structures of two types of education. If the competition index is 0, on the other hand, there are no occupations in which graduates from both types of education work.

Figure 3.1 gives a schematic overview of the relationships between the types of education which have been distinguished. In principle every overlap in the occupational domain of 0.30 or greater is shown with a line between the domains. But for the sake of clarity, relationships between types of education which differ in educational level by more than one level have been omitted. For example, *HVE agriculture and environmental science* has an affinity not only with the course of the same name at IVE level, but also with *PVE agriculture and the natural environment*. It was also found that a number of occupational groups

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link very many types of education together. Because this would make it difficult to grasp the overall picture of the structure of the labour market, the relationships between types of education which are related largely via these occupational groups are not indicated separately: rather these types of education have been represented as one cluster.

As noted in the previous section, it is beneficial for workers if their educational background or occupation offers many opportunities to switch within the labour market. This makes them less dependent on developments in a particular occupation or a particular economic sector. Employers also run less risk in recruiting personnel if they can recruit from a broad range of types of education. However a strong relationship between the various occupational domains in the labour market is advantageous not only at an individual level, but also for society as a whole. In practice, the overlap in the occupational domains of types of education makes it possible for demand and supply in the labour market to adjust to one-another more easily. This means that a mismatch between demand and supply for particular types of education need not immediately lead to unemployment or unfilled vacancies. For example, discrepancies between demand and supply also lead to shifts in the occupational structure of employment for workers with a particular educational background. People will find themselves with a different place in the labour market than they might initially have expected. However this adjustment is in general not without negative consequences. Where there is an over-supply of workers with a particular type of education they often have to accept work at a lower level, or outside the field in which they trained. Moreover, these positions are generally less well paid and have more flexible labour contracts. Where there is a supply shortage, the costs of adjustment must be met by the employer. In this situation they are forced to hire people with education of a lower or less appropriate level, as well as having to offer higher wages and better working conditions in order to hold their personnel (Wieling and Borghans, 1995). However these costs of labour market flexibility are generally preferable to the unemployment or hard-to-fill vacancies which result from a more rigid labour market.

Clearly demarcated market segments

There are a number of types of education, especially in higher education, which serve a very distinctive occupational domain. Naturally *UE veterinary and medical sciences and dentistry* and *UE pharmacy* have their own clear occupational domains. There are three other types of university education which do not have a clear overlap with other types of education: *UE arts* and *UE fine arts*, for which the main occupational domains are teaching functions in secondary and higher education and in the relevant fields[4] and *UE theology* which has its own clear domain as training for pastoral vocations. At the level of HVE, three types of education have reasonably clearly demarcated occupational domains: *HVE teachers' training*, which has a clearly demarcated occupational field in the educational professions, *HVE interpreter and translator*, whose graduates largely work as linguists, interpreters and translators, and *HVE transport and harbour*, with its own clear occupational domain among pilots, flight engineers, transport supervisors and inspectors and freight handlers.

At the level of IVE, chemical process workers, in particular, provide a separate occupational domain for graduates from *IVE process technology*, and *IVE medical technology* focuses chiefly on pharmacy assistants, opticians and orthopaedists. At the level of PVE, finally, only *PVE in utilities installation* and *PVE security* have strongly demarcated occupational domains: those of plumbers and utilities installers on the one hand, and of bailiffs and security officers within the occupational class of police, fire and

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4. Because of the heterogeneity of teaching as a profession, the degree of overlap in this occupation has not been included when calculating the competition index.

security officers.

Large occupational sub-markets

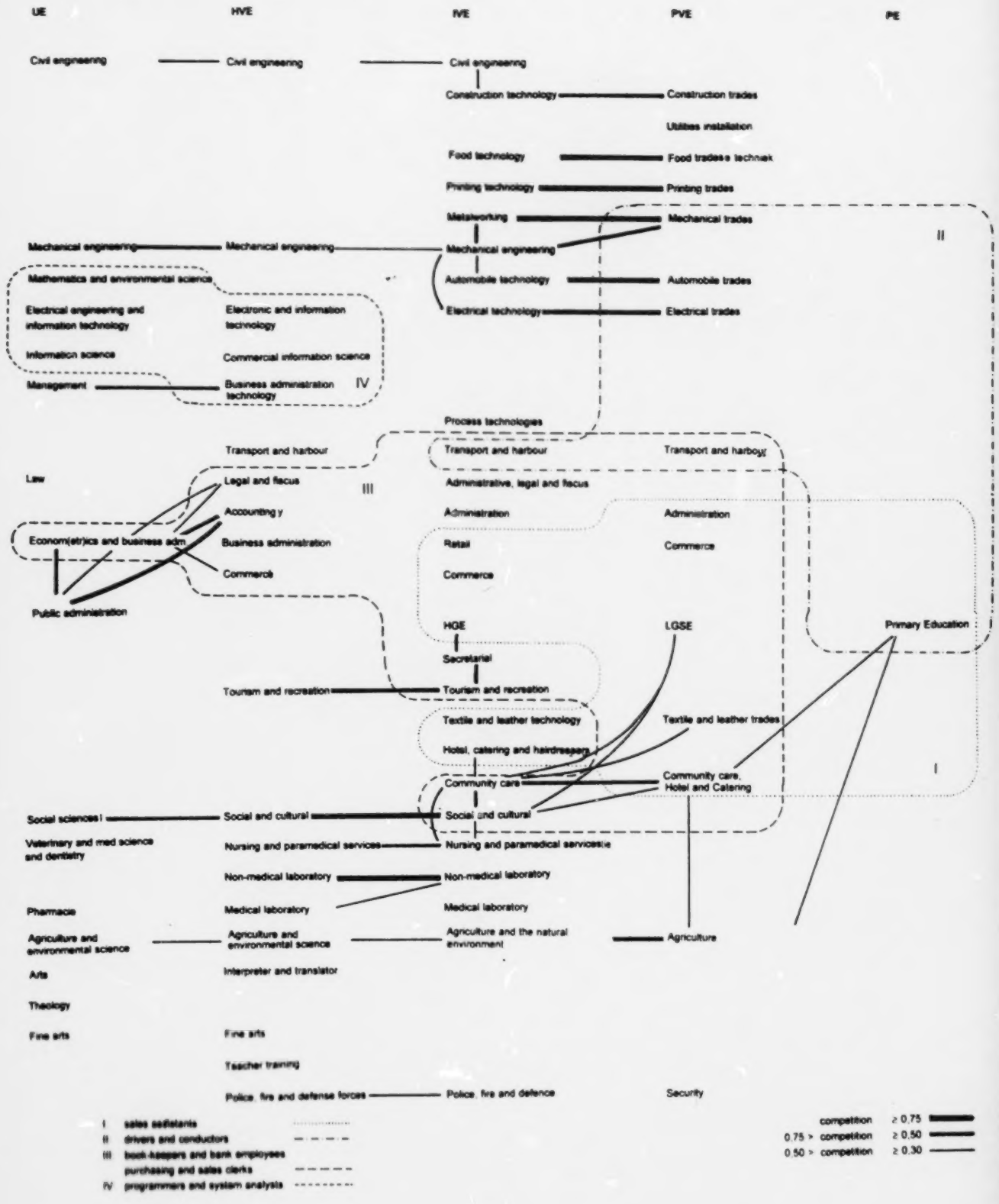
As noted above, there are five occupational classes which form common links between the occupational domains of large groups of educational types. In figure 3.1 these types of education have been represented in the form of a single cluster. The first of these is the occupational class of sales assistants, in which there is competition between the following types of education: *PVE commerce and administration; IVE/apprenticeship textile and leather technology; PVE textile and leather technology; PVE community care; IVE/apprenticeship commerce and administration; PVE administration; LGSE; IVE/apprenticeship commerce and administration; IVE/apprenticeship micro-mechanical technology; HVE commerce and administration; HGSE; IVE/apprenticeship hotel catering and hairdressing.*

The occupational class of drivers and conductors links *PVE transport and harbour; IVE/apprenticeship transport and harbour; PVE automobile mechanics, Primary Education; PVE mechanical technology; PVE electronic technology* and *LGSE*. The situation is similar to that of the sales personnel: these are occupations with only minimal educational requirements in terms of trade-specific training, so that people with very divergent educational backgrounds are recruited. For sales personnel, however, these recruits are largely women, so that it is mainly the types of education with mainly female students which exhibit a strong inter-relationship in the occupational field of sales assistants. Drivers and conductors, on the other hand, are mainly men, so that this occupational class links mainly the types of lower education which are predominantly studied by men.

A third cluster is formed by the administrative occupations of 'administrators and bank employees' and 'freight handlers, packers, and packaging workers' which provide an important field of work within the occupational domains of a large number of types of education. *LGSE; PVE administration; HGSE; IVE/apprenticeship commerce and administration; IVE/apprenticeship commerce and administration; IVE/apprenticeship secretarial; IVE administrative, legal and fiscal; HVE administrative, legal and fiscal* and even *UE economics, econometrics and business administration* compete with one-another in both occupational classes. Furthermore, in the first of these two occupational classes, people are recruited from educational backgrounds in *PVE community care; IVE/apprenticeship transport and harbour; IVE/apprenticeship administrative; IVE tourism and recreation* and *HVE commerce and administration*, while the types of education *IVE social and cultural; IVE/apprenticeship community care* and *UE law* are recruited for the commercial and administrative occupations. All in all, these administrative occupations seem to form the most important target segment for those switching from their 'own' occupations.

Finally, the occupation of system analysts, programmers and system supervisors serves as occupational domain for a large number of types of education: *HVE business automation technology, UE computer science, HVE electronic technology and technical computer science, UE electronic technology and technical computer science, HVE technical business studies* and *UE mathematics and natural sciences*. This example clearly illustrates the flexibility which the labour market can exhibit where there are large discrepancies between demand and supply. To meet the enormous growth in the demand for computer and information science specialists, graduates from numerous types of education have in past years been recruited. Because a large part of the demand in computer-related occupations has been satisfied in this manner, this discrepancy has also improved the prospects of those with these types of education. Employers have been required to make their jobs sufficiently attractive to be able to recruit graduates from other types of education.

Figure 3.1
Relationships between types of education



It is however striking that none of the major destination segments for switching which have been discussed above feature in table 3.4, which presents the occupational classes with many opportunities for substitution between types of education were. The educational background of these occupational classes is even more widely scattered than for the five main destination segments. This means that the employment in the relevant occupational classes does not provide a substantial share of the labour market opportunities for the related types of education, so that, in quantitative terms, there is also no congruence or competition between types of education in these occupational classes.

Specialisation and flexibility

The disadvantage of high labour market flexibility is that, although an employer can recruit from a broad segment of the school-leavers for a particular occupation, many of them will have taken a course which is not tailor-made for this occupation. This necessitates extra training or a longer settling-in period. There are also limits to the degree to which an employer can seek substitutes from other types of education when recruiting workers. These limits will be different from one occupation to another. The figure clearly shows that it is particularly the occupations at lower levels and in commercial and administrative fields in which greater flexibility is possible. For a number of specialized occupations such as physicians or teachers, there is no such flexibility at all. This naturally raises the question of whether the strong link between education and occupation is in every case really inherent in the job description: could additional labour market flexibility be achieved by adjusting the curriculum? One clear example in this respect can be seen in the technical types of education. Although the highly specific nature of technical courses would appear to dictate that each course should be strongly focused on a specific technical occupation, in practice the opportunities to switch which are offered by technical types of education are generally no narrower than for other types of education. Moreover, there are more similarities between the occupational domains of the technical types of education than between the domains of other types of education. As noted above, more detailed analysis of the labour market for those with technical education has shown that this labour market flexibility derives from the fact that many of these personnel work in non-technical occupations. Especially in these non-technical occupations, those with technical training appear to be good substitutes for one-another, whereas within their technological fields they do have a strongly demarcated occupational domain. This specific structure of the labour market for those with technical education means that these types of education — despite their specialized character — are able to adjust to fluctuations in the labour market (Borghans, De Grip and Smits, 1995).

Generally, the more atypical types of education are also those with few opportunities to switch, which were discussed in the previous section. However there are cases in which a type of education offers few opportunities to switch, because it is focused on a specific occupation, but yet faces a considerable overlap in its occupational domain with other types of education. This occurs because these competing types of education are also focused on this occupation, perhaps in addition to a focus on other occupations. This phenomenon can be seen, for example, in the case of *HVE business administration technology* and *UE computer science* which, along with many other types of education, are strongly focused on the occupation of system analysts, programmers and system supervisors. Another example is *IVE/apprenticeship administrative*, which offers graduates few opportunities to switch, while many other types of education also provide people for its major occupational domains: administrators and bank employees and freight handlers, packers, and packaging workers. Apparently these types of education have strongly specialised in preparing students for occupations to which many other types of education also provide access. The question is whether this specialisation, which should lead to a better match between the training given and that particular occupation, compensates for the extra vulnerability which these types of education suffer. If the number of job openings in the relevant occupations is below

expectations, the less specialized types of education can switch to other occupational classes, while the specialists do not have these opportunities to switch.

Similarities between levels

In general it is striking that strong similarities are found mainly between types of education in the same discipline but one level higher or lower. Overlaps between the occupational domains of types of education at the same level do occur, but they are generally considerably smaller than those between different levels. The inter-level overlap for the agricultural and technical types of education is strong mainly between University Education and HVE, and also between IVE and PVE. In contrast, there seems to be a clearer demarcation between HVE and IVE.

The similarities between University Education and HVE were also recently noted by the Scientific Council for Government Policy (WRR, 1995), which spoke then of the blurring of the boundaries between higher vocational education and university education. But it can be seen that the occupational domain in which a university course competes across levels is often not the most important occupational domain for that type of education. Thus there are quite specific academic occupations, yet many academics hold jobs for which those from HVE are also recruited. Naturally this also increases the flexibility of the labour market. One example can be seen in *UE social and cultural* and *HVE social and cultural*. While the most important occupation for *those with UE social and cultural* is that of social scientist, there is also a large overlap with *HVE* (and also *IVE*) *social and cultural* in the occupational class of community workers and probation officers.

However for a number of types of education which are focused on non-commercial services (those for *tourism*, *nursing* and *social and cultural work*), there is a strong relationship between the courses at IVE and HVE level. In the field known as *technical laboratory* the overlap in occupational domains between the courses at IVE and HVE levels are also strong. Most of these subject areas have no clear equivalent course at the levels of University Education or PVE.

4 Modelling substitution processes

The previous chapter showed that there is indeed no exclusive relationship on the labour market between types of education and occupations. Almost every educational type does have, however, a specific domain at the labour market of only a limited range of possible occupations. Within this domain also other types of education are able to provide workers for parts of it. Therefore, there remains a overlapping structure of occupational domains, which enables the labour market to adjust to structural changes, temporal strocks and discrepancies between supply and demand.

The labour market therefore has the tast to match employers needs for jobs to be fulfilled and the available qualifications. The match actually observed should be regarded upon as result of a market mechanism in which the requirements of employers are confronted with the possibilities supply can offer. The fact that for a certain job one specific type of education is demanded does not imply that these people are most suited for this job per se, but that *given the labour market situation* these people are the best candidates.

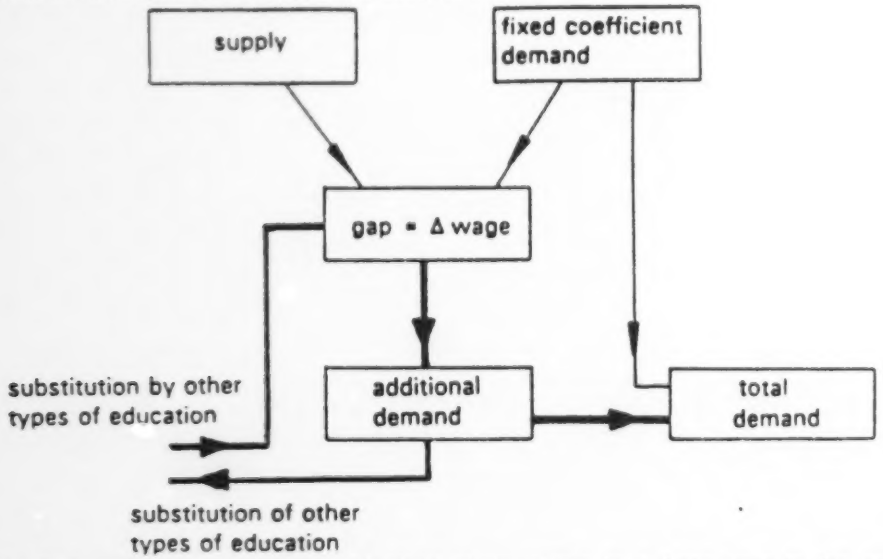
In this chapter therefore a model is described in which the demand and allocation of people with a certain educational background is explained. Demand depends on shifts in the economic activities (sectoral shifts

and shifts in occupations) but also on possible upgrading processes in which employers require higher qualifications than before. Supply mainly depends on the inflow and outflow on the labour market.

To provide forecasts of the requirement which are based on more information than only from the most recent labour force survey, therefore a substitution model is needed to identify both the exogenous demand shifts and the adjustments due to a change in labour market situation. In Borghans and Heijke (1996) such a model has been introduced. Its main structure is depicted in figure 4.1. The process starts with a model for supply and demand based on the present educational structure of occupations. Together supply and demand determine the gap between supply and demand. According to the interpretation provided in chapter 2 this gap can be viewed upon as the change in the labour market situation of the type of education concerned. The change in wage will lead to additional demand in certain occupations. If within an occupation demand for one type of education increases because of its lower price represented by its worsened labour market situation, other types of education will face a decrease in demand. A discrepancy between supply and demand for one type of education will therefore affect the *ex ante* demand for others. *Ex ante* demand and additional demand together determine *ex post* demand, which is actually observed in the labour force surveys.

By filling in all parts of the model by specific mathematical specifications, which might depend on certain parameters, it becomes possible, by a econometrical estimation procedure to identify the effects present in the model. It therefore becomes possible to seperate changes in initial demand from additional demand due to changes in the labour market situation and from substitution effects. In a classical manpower requirement model the forecasts of the expected labour market tensions are determined by the initial demand and supply only. Within this model it seems relevant, however, to include changes in demand due to substitution from others in the *ex ante* demand since these might also affect the labour market situation. Additional demand should be excluded from the requirement since this additional demand is caused by a change in the labour market situation. To measure the size of the change needed to equilibriate the market, actual manifestations of this change have to be excluded.

Figure 4.1
Ex ante demand and substitution processes on the labour market



This simplest model which measures demand given wages in a base year is the so-called fixed coefficient demand model. In this model it is assumed that — given the wage structure — the distribution

of demanded types of education for each occupation is constant. If the demand for each occupation (w_j^t) is known the fixed coefficient demand for educated labour (fc_{ij}) equals in that case:

(4.1) $$fc_{ij} = w_{ij}^{t-1} \frac{w_j^t}{w_j^{t-1}}$$

w_{ij}^{t-1} represents the number of people with educational backgound i in occupation j in the base year t-1. in total the fixed coefficient demand equals:

(4.2) $$FC_i = \sum_j fc_{ij} = \sum_j w_{ij}^{t-1} \frac{w_j^t}{w_j^{t-1}}$$

Changes in demand for a type of education are in this model therefore completely determined by changes in the demand for an occupation. The fixed coefficient model only uses data on the last observation. Although the model is very simple, it is however theoretically very interesting. Very often, the fixed coefficient model is extended by estimating the trends in the distribution of the educational structure of occupations. The problem with this extension is that in that case educational structures are being compared in which possibly a different labour market situation prevails. Trends in the educational structure are therefore composed of trends in the demand *per se*, together with trends in the change in demand due to changes in the wage, or labour market situation. As is discussed in the introduction it is however for interpretation reasons very important to distinguish both causes of changes in employment.

A shortcoming of the fixed coefficient model is however that it excludes, given the wage structure, changes in the optimal distribution of types of education over an occupation. Such adjustments might occur due to technological changes. For that reason it seems to be more appropriate to model demand as a function of, amongst others, the fixed coefficient influence on demand.

(4.3) $d_{ij} = d_{ij}(fc_{ij},....)$

Of cource, equation (4.3) can be made as complex as wanted by introducing other explanatory variables, or introducing lag structures in the fixed coefficient part, which might indicate adjustment costs. Borghans and Heijke (1996) use the educational level, and the distance between educational and occupational level as an additional explanatory variable. This model has been used for the forecasts descriped in this paper. Borghans (1996) includes a trend variable in each component of demand. This trend variable makes it possible to extrapolate trends in demanded qualifications. In contrast with the extrapolation of employment variables this approach does not mix up demand in different labour market situation since d_{ij} is extrapolated and not w_{ij}. For the main argument of this paper, the seperate measurement of demand and supply effects on the employment structure, these extensions are however not important.

(4.3) describes the demand for a type of education within an occupation given the wages, or more generally the labour market situation in the base year t-1. This demand-figure might however differ from supply of this type of education. The discepancy between supply and demand equals:

(4.4) $G_i = D_i - S_i$

If this gap G_i is positive, there is more demand than supply for type of education i. Therefore the labour

market position will improve. Opposed to this, if there is a surplus of supply from type of education *i* the labour market position will fall. The discrepancy between supply and demand can therefore be used as an indicator of the changes in the labour market position. An increase of the labour market position means that this type of educated labour becomes more expensive. This implies that at the new labour market conditions, demand, and thus employment, will be smaller:

(4.5) $w_{ij} = d_{ij} - \alpha_{ij} G_i$

Neglecting the possibility of unemployment[5], the parameters α_{ij} must be such that all surpluses get employed somewhere:

(4.6) $\sum_i \alpha_{ij} = 1$

As a consequence of the redistribution of labour some occupations get additional and others less supply. This discrepancy at occupational level equals:

(4.7) $P_j = \sum_i \alpha_{ij} G_i$

Some occupations therefore experience additional supply due to the fact that many of the types of education which are employed in this occupation are in a situation of surplus. Since the assumption is made that the total demand per occupation does not depend on labour market circumstances, the surplus has to lead to lower demand for some types of education. Therefore (4.3) has to be replaced by:

(4.8) $d_{ij} = d_{ij}(fc_{ij},...) + \beta_{ij} P_j$

(4.8) can be interpreted as the demand for *i* in occupation *j*, given the wages in the base year for workers with educational background *i*, but also given the substitution effects due to discrepancies at the labour market for other types of education. The additional demand $\sum_j \beta_{ij} P_j$ is called the *substitution demand*.

Total employment after these substitutions consists of:

(4.8) $w_{ij} = d_{ij} - \alpha_{ij} G_i + \beta_{ij} P_{ij}$

By reading all equation starting from (4.4) with these new definition of d_{ij} and w_{ij} an interrelated system occurs. Given the values for c_{ij}, α_{ij} and β_{ij} and based on the employment structure in the base year and supply and demand figures for the year *t*, an iteration process can be used to calculate the values of G_i, P_j and w_{ij}. This implies that the model predicts both the discrepancies between supply and demand indicating changes in the labour market position and the employment structure.

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5. Borghans and Heijke (1996) suggest a way to introduce unemployment in this model. Lack of unemployment data makes it impossible, however, to use such model empirically. Neglecting unemployment in this context can be shown not to influence the main results.

5 Results

5.1 Components of demand

As has been stated in the previous chapter may become necessary to change the educational structure of an occupation because of changes in the nature of the occupation, so that the type of education which is most suitable for that occupation gradually changes. This can, for example, arise due to the arrival of new technologies, which can lead to an upgrading process if the complexity of the technologies being adopted makes a higher educational level necessary. On the other hand, there can also be downgrading, if automation means that there is less need for trade skills in the production process (Spenner, 1985).

As has been said, discrepancies between demand and supply can also result in shifts in the educational structure of occupations. An oversupply of people with a particular type of education will result in school-leavers switching to the labour market segments previously occupied by those with more or less related types of education. For example, an over-supply of those with higher education can lead to the crowding-out of those with lower levels of education, and *vice versa*, if there are recruitment problems with a particular educational category employers can substitute school-leavers from other types of education.

In this chapter the empirical results of labour market projections based on the model described in the previous section will be presented. These forecasts of the labour market by education and occupation predict the labour market changes for the period 1995-2000.

The demand for school-leavers from particular types of education is determined first by changes in the employment in economic sectors. In addition to this *economic sector effect*, there will also be different changes in the employment levels for the various occupational classes within a single economic sector. This *occupational effect* is due to some extent to the heterogeneity of the economic sectors as these are defined, but also to changes in the activities within an economic sector. Moreover, the skills which are demanded in these occupations also change. As the result of these changes, some types of education which are better adapted to the developments in the demand for qualifications will show a positive *education effect*. These three effects combined represent the shifts on the demand side. As a result of discrepancies between the types of education which are in demand and the available supply, there are inevitable shifts in the demand. In that case, employers adjust their desires in accordance with the availability of workers. The latter effect is designated as the *substitution effect*.

In recent years demand has lagged behind supply for a number of specific disciplines at university and IVE levels, for the HVE level, and especially at the PVE level (Borghans, 1996). This has meant that school-leavers from these types of education have been forced to switch to other occupations. Because of the great increase in the numbers of students from IVE entering the labour market, in recent years those with IVE have also been crowded-down to occupations at the PVE level (Matheeuwsen, Smits and Willems, 1994). However, because of the decline in the supply of school-leavers and the increasing demand for newcomers, the macro-relations between demand and supply for school-leavers are expected to become more favourable in coming years. This means that the crowding-down will be much reduced. Nevertheless labour market discrepancies will emerge in the coming years, and these will also result in shifts in the occupational domains of particular types of education.

Table 5.1
Types of education for which the 'economic sector effect' has a high, or low, impact on employment levels

	Economic sector effect %	Total %
High economic sector effect		
UE veterinary and medical sciences and dentistry	1.7	3.4
IVE/app. nursing and paramedical services	1.7	1.7
HVE nursing and paramedical	1.7	3.4
IVE/app. medical laboratory	1.6	1.9
UE theology	1.6	3.2
HVE medical laboratory	1.5	3.2
IVE/app. hotel, catering and hairdressers	1.5	-0.2
IVE/app. community care	1.4	0.3
HVE fine arts	1.2	3.6
IVE/app. automobile technology	1.1	0.3
Low economic sector effect		
IVE/app. agriculture and natural environment	-0.9	-1.3
PVE agriculture and natural environment	-0.7	-3.3
HVE teacher training	-0.2	1.6
HVE police, fire and defense forces	-0.1	1.7
PVE mechanical technology	0.0	-2.0
PVE utilities installation	0.0	-2.4
PVE security	0.1	7.4
UE fine arts	0.1	2.8
IVE police, fire and defense forces	0.1	2.7
UE arts	0.3	3.9

Source: ROA

This section illustrates the significance of these shifts in demand and supply for the various types of education. Tables 5.1 to 5.4 list the types of education with the largest or smallest economic sector effect, occupational effect, education effect and substitution effect, respectively. The top part of table 5.1 gives an overview of the types of education with relatively large *economic sector effects*. It can be seen that, it is mainly the types of education which are strongly dependent on commerce, general commercial services and non-commercial services which will enjoy strong growth if the expected developments in economic sectors flow through, in their entirety, to the demand for those with these types of education. This economic sector effect is evident at the levels of IVE, HVE, and UE. In contrast, relatively few people with PVE work in these sectors, so that they profit less from the growth in these sectors. However it striking that a number of types of education at IVE level do not share the benefits of growth in the economic sectors. The negative occupational effect, especially for *IVE hotel, catering and hairdressers*, *IVE community care*, and *IVE automobile technology* indicates that those with this educational background work mainly in occupational classes in which employment growth is lagging behind.

The bottom part of table 5.1 shows the types of education for which the expected changes in the structure of employment by economic sectors are most unfavourable. It is striking that only four types of education would suffer a drop in employment if changes in the economic sectors were the only factor which determined demand. These four include two types of education which are almost entirely dependent on the government sector, i.e., *HVE police, fire and defense forces* and *HVE teachers' training*, and two types of education in the agricultural sector, *PVE* and *IVE* in *agriculture*. However the educational occupations, in which most people with an educational background in *HVE teachers' training* work, are not expected to suffer from the employment reductions in the government sector. Furthermore, *HVE police, fire and defense forces* will benefit from a strong educational effect. Ever more specifically-trained workers are expected to be employed in the growing security industry, which has thus far offered employment to people with very diverse educational backgrounds.

The employment for a particular type of education can also benefit where there is a relatively strong growth in employment in an occupation within an economic sector. Table 5.2 shows which types of education profit most, and least, from this *occupational effect*. Because the greatest growth in jobs is expected for system analysts, programmers, and system supervisors, and for economists and accountants, the list of courses with a positive occupational effect contains mainly those types of education which are focused on these occupational segments. It is striking that a positive occupational effect is found mainly for courses in HVE and University Education. The types of education with the most negative occupational effect are mainly at the levels of PVE and IVE. One exception is *HVE police, fire and defense forces*, which suffers from substantial negative growth because of the expected cuts in the army. Apart from this case, the negative occupational effect is evident mainly for technical courses at PVE level, because functions at the lower level are being replaced by functions at an intermediate level. This points to an upgrading of the qualifications demanded in technical fields at the level of IVE and PVE. Job growth will also be poor for graduates from a number of IVE courses which focus chiefly on services. In this case functions at an intermediate level are giving way to jobs at a higher level. These findings are in accordance with the structure of the labour market which was outlined in the previous section. In technological fields, competition is found mainly between the various types of education at the level of IVE and PVE, while in the services field the competition is mainly between the types of education at IVE and PVE levels. Thus both of these segments of the labour market are experiencing a shift in the occupational structure which works to the advantage of the higher type of education.

Table 5.2
Types of education for which the occupational effect has a high, or low, impact on the change in employment levels

	occupational effect %	total %
High occupational effect		
HVE business administration technology	4.6	0.3
UE computer science	3.2	8.2
HVE electronic technology and technical computer science	3.0	6.6
UE economics, econometrics and accountancy	2.9	7.8
UE electronic technology and technical computer science	2.7	7.8
HVE accountancy	2.4	6.1
UE mathematics and natural sciences	2.1	6.1
UE business administration	2.1	7.5
HVE technical business administration	2.0	5.5
UE public administration	1.9	6.1
Low occupational effect		
IVE/app. hotel, catering and hairdressers	-1.4	-0.2
IVE/app. community care	-1.1	0.3
HVE police, fire and defence forces	-1.1	1.7
PVE construction technology	-1.1	-2.1
PVE automobile technology	-1.0	-2.0
PVE textile and leather technology	-1.0	-1.9
IVE/app. automobile technology	-0.9	0.3
IVE/app. secretarial	-0.9	0.2
Primary Education	-0.8	-3.1
PVE community care	-0.7	-1.5

Source: ROA

There may also be shifts in the qualifications which are required within an occupational class. Here again, the general picture is of an upgrading process. With the exception of *PVE security* and *IVE police, fire and defence forces*, all the courses in the list of types of education which profit most from the educational effect are at university level (see table 5.3). In the case of *PVE security* and *IVE police, fire and defence forces*, the positive educational effect arises because a diploma in security training is increasingly

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required for jobs in the private security industry, and it is much less common than was once the case to hire someone with a very different educational background. It can be seen that strong declines in demand are expected for *LGSE* and *Primary Education*, and for many of the courses at PVE level. In the lower-level occupations it is becoming increasingly common to require a diploma from IVE or an apprenticeship, rather than PVE.

All in all, it can be seen that strong increases in demand will be felt mainly for those with higher education, many of whom work in economic sectors such as 'other commercial services' and 'non-commercial services' which are expected to enjoy significant growth. The expected government cut-backs are the only negative component in the economic sector effect for those with university education. Furthermore, it can be seen that it is chiefly the higher occupations within these sectors which will experience strong growth. Especially in the service sector, the growth in employment in intermediate and lower-level occupations appears to be less rapid than the growth in the economic sector as a whole, while growth for the higher occupations is more than proportional to sectoral growth. Thus a strong shift in the occupational structure of these economic sectors is taking place. Finally, higher qualifications are increasingly being demanded, in various occupations.

Table 5.3
Types of education for which the educational effect has a high, or low, impact on the change in employment levels

	educational effect %	total %
High educational effect		
PVE security	4.9	7.4
IVE police, fire and defence forces	3.4	2.7
UE business administration	2.6	7.5
UE economics, econometrics and accountancy	2.4	7.8
UE computer science	2.2	8.2
UE electronic technology and technical computer science	2.0	7.8
UE public administration	2.0	6.1
UE civil engineering	2.0	6.0
UE mechanics	1.9	6.1
UE social and cultural	1.9	4.7
Low educational effect		
Primary education	-2.8	-3.1
PVE administration	-1.6	-1.6
JGSE	-1.5	-1.2
PVE commerce and administration	-1.3	-0.9
PVE electronic technology	-1.2	-1.4
PVE printing technology	-1.0	-0.9
PVE automobile technology	-1.0	-2.0
PVE textile and leather technology	-1.0	-1.9
PVE community care	-1.0	-1.5
PVE food technology	-0.9	-1.6

Source: ROA

Naturally there is not only a growing demand for new entrants to the labour market with a diploma at the level of HVE or University Education, but also a considerable supply. Whereas the total demand for graduates from lower education is expected to exceed the supply in the coming years, for many types of education at the HVE and University levels there will be a supply shortage. In filling these vacancies, extra job openings will be created for other types of education, at university and HVE level in the first place, but to some extent also at IVE level. Table 5.4 shows that this sort of substitution demand has an impact especially for a number of technical UE and HVE courses. There will be extra job openings for those with *UE electronic technology, UE computer science, HVE business administration technology, UE*

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mathematics and natural sciences and *UE business administration* because of shortages of newcomers from the types of education which are focused especially on computer-related occupations and to a lesser degree, from the courses for accountants, economists and accountants. The substitution demand for those with *UE economics, econometrics and accountancy* is mainly due to supply shortages from other types of education which also focus on economic specializations. *UE civil engineering* profits very much from the shortages for those with *HVE civil engineering*, while *UE agriculture* will benefit from extra job openings because a number of technical courses in University Education cannot meet the demand. Although the link between *UE agriculture* and *UE engineering* is too weak to be shown in figure 4.1, the substitution effect here is sufficiently strong to benefit *UE agriculture*. This shows that even a slight overlap between the occupational domains of types of education can be very important for the generation of substitution effects. The only type of education below HVE level which will enjoy a large substitution demand is *PVE security*. There will be many extra job openings for this type of education because *IVE police, fire and defence forces* cannot satisfy the demand. Thus there is a substitution effect in the private security sector. While there is a clear tendency to employ people with a satisfactory diploma for this occupation, employers are forced to recruit people from PVE in place of IVE to meet the demand. In most cases the non-regular PVE course is one that people undertake when they are already employed by a security firm.

Table 5.4
Types of education for which the substitution demand has a high, or low, effect on the change in employment levels

	substitution demand %	total %
High substitution demand		
UE electronic technology and technical computer science	2.3	7.8
UE civil engineering	2.3	6.0
UE computer science	2.2	8.2
UE engineering	2.1	6.1
HVE business administration technology	2.0	8.3
UE mathematics and natural sciences	2.0	6.1
PVE security	1.9	7.4
UE business administration	1.8	7.5
UE economics, econometrics and accountancy	1.8	7.8
UE agriculture and environmental studies	1.8	5.0
Low substitution demand		
PVE agriculture and natural environment	-1.4	-3.3
PVE transport and harbour	-1.3	-1.8
PVE utilities installation	-1.2	-2.4
IVE/app. agriculture and natural environment	-1.0	-1.3
PVE textile and leather technology	-1.0	-1.9
PVE automobile technology	-0.9	-2.0
PVE construction technology	-0.9	-2.1
PVE mechanical technology	-0.9	-2.0
PVE community care	-0.9	-1.5
PVE food technology	-0.8	-1.6

Source: ROA

Because of the relatively favourable relationship between the total supply of school-leavers and the demand for newcomers over the coming years, the crowding-down processes at the lower end of the labour market will also be weaker than in the past. Despite the upturn in the business cycle, the greater flow of people entering the labour market from IVE will put the labour market prospects for those with PVE under considerable pressure. However the economic recovery will bring demand and supply for those with IVE closer to equilibrium, so that fewer PVE jobs will be taken by people with IVE. Nevertheless a number of PVE courses will be considerably inconvenienced by the over-supply of

workers without any educational qualifications. Because most of the school-leavers from many PVE courses work in occupations for which no qualifications are required, for example as drivers and conductors, they face strong competition from workers without any qualifications, of which there is an enormous over-supply. This is the case especially for *PVE construction technology*, *food technology*, *utilities installation*, *mechanical technology*, *automobile technology*, *transport and harbour* and *textiles*. *PVE community care* and *PVE agriculture* are the only PVE courses which will suffer clear downward pressure from people with IVE, as a result of the over-supply of *IVE community care* and *social and cultural* (for *PVE community care*) and *IVE agricultural* (for *PVE agricultural*).

5.2 Shifts in employment by educational levels

The previous section outlined a picture of the changes in employment per type of education. To complete this chapter, this section will bring together the most important shifts in employment, using two tables to present the overall position. Table 5.5 shows the extent to which the demand for labour will change as a result of the economic sector, occupational, educational and substitution effects in the coming five years. These changes in employment levels refer to the net effects per educational level, so that the positive and negative shifts experienced by the various types of education within the same level cancel each-other out. Therefore table 5.6 completes this picture by presenting the sum of the negative and positive effects for each educational level.

Table 5.5
Components of the changes in employment levels per educational level (net effects), 1995-2000

	sector effect %	occupational effect %	educational effect %	substitution %	total %
Primary education	4.2	-4.2	-13.1	-1.7	-14.8
JGSE, PVE	4.0	-3.1	-5.4	-3.2	-7.7
SGSE, IVE/app.	4.6	-1.0	1.8	-0.7	4.7
HVE	3.7	5.8	4.9	3.8	18.2
UE	3.7	7.1	9.3	7.2	27.3
Total	4.2	0	0	0	4.2

Source: ROA

Table 5.5 shows that the expected growth in employment in the various economic sectors would lead one to expect growth in the demand for every educational level. This economic sector effect is greatest at the IVE/apprenticeship level, followed by Primary Education. The smallest growth would be expected for the types of education at HVE and university level, because of the expected decrease in government employment. In fact the differences between the levels are not great. The total growth is 4.2% over five years, with the economic sector effect for HVE expected to be 3.7% while IVE and apprenticeships are expected to enjoy 4.6% growth.

The occupational effect is negative for primary education, PVE and IVE/apprenticeship, but indicates vigorous growth in employment at HVE and university level. The reduction in demand for those with primary education, as a result of this occupational effect, is so great that the positive sector effect is almost entirely cancelled out. For HVE and University Education this occupational effect more than triples the increase in employment.

The educational effect also means a big reduction in the expansion demand for workers without any educational qualifications, and to a lesser extent also for those with PVE. In contrast, HVE and University Education win a big share of the demand as a result of the educational effect, and those trained at

IVE/apprenticeship level will also enjoy a small positive effect from these shifts in qualification requirements.

Finally, the substitution effects add up to a further reduction in employment for people with PVE, in particular, and to a somewhat lesser degree also for those without any qualifications. These lowest educational levels will suffer markedly from downward pressure from those with intermediate-level qualifications. For IVE and apprenticeships, the net substitution effect is slightly negative. HVE, and especially University Education, profit from the shortage of those with other types of education.

As has been noted above, the changes in employment levels can vary markedly between the various disciples taught within a single level. Table 5.6 therefore presents the sums of the total shifts in demand between the various types of education. If, for example, one type of education at IVE level has a positive occupational effect, and another has a negative occupational effect, in the table the two mutations are added rather than cancelling each-other out.

At IVE/apprenticeship level there are large differences between the sum total of mutations and their net effect, which implies that, at this level in particular, there are contradictory developments for the various types of education. Apparently IVE/apprenticeship is teetering on the brink of growth, or of cutbacks. At this level the occupational effect, and to a somewhat lesser extent the substitution effect, produce many more changes than are visible in the net effects.

The totals given in table 5.6 indicate the relative weights of the separate effects in the overall shifts in demand. The largest shifts in employment are due to the educational effect, although the magnitude of this effect is smaller than might be expected on the basis of table 5.5. This is because the educational effect is strongly determined by the educational level, so that there are relatively few counterbalancing shifts within a level. The educational effect is followed in importance by the economic sector effect and then by the occupational effect, although in fact the three effects do not differ markedly in magnitude. The substitution effects, as a result of shortages or excess supply in related types of education, are very much smaller. University Education is the only level at which the passive substitution demand accounts for a large proportion of the total demand.

Table 5.6
Sums of the negative and positive effects per educational level

	sector effect %	occupational effect %	educational effect %	substitution %	total %
Primary education	4.2	4.2	13.1	1.7	14.8
JGSE, PVE	4.4	3.2	5.8	3.3	8.3
SGSE, IVE/app.	5.1	2.2	2.2	1.9	5.4
HVE	4.1	6.0	4.9	3.8	18.2
UE	3.7	7.7	9.3	7.2	27.3
Total	4.6	3.6	4.9	2.9	10.6

Source: ROA

Finally, the separate effects on the change in employment levels can also cancel each-other out to some extent. The shifts for these four effects add up to 16.0%, but the net effect is just 10.6%. Thus of the 16.0% sum total of the effects, 29% can be attributed to the economic sector effect, 23% to the occupational effect, 31% to the educational effect and 18% to substitution.

6 Conclusions

In this paper it has been shown that substitution processes between different types of education play a crucial role in the adjustment of the labour market to changes in supply and demand. The existence of these substitution processes implies that trends in employment should be interpreted carefully. The increase of employment of a certain educational category in an occupation might indicate at both changes in demand and in supply. In the first case — an increase in demand — the labour market situation of the category involved will improve whereas in case of an increase of supply there will be a worsening of the labour market position.

It has been shown that in the Dutch situation many substitution possibilities exist between comparable disciplines in education at subsequential levels. Substitution possibilities between different disciplines can however also not be neglected. Some occupation which form a major contribution to total employment in the Netherlands, recruit people from many different types of education. There will be, in the next five years, a further shift of demand from lower to higher levels of education. Although all levels of education could profit form the growth within sectors of industry, the lowel levels loose demand due to the fact that they are employed in occuption which grow relatively slow a will decrease the next five years. More importantly, employers will more and more require higher qualification levels for their occupation. Most drastically this upgrading process leads to a further decrease in demand for unschooled workers and workers with only a qualification at the lower vocational level.

Taken together, at the lower educational levels supply will exceed demand while at the higher educational levels there will be for most types of education sufficiently job openings for all school-leavers who will enter the labour market. Therefore it is expected that the labour market perspectives of many higher types of education are good, while many types of education at lower levels are less satisfying. Substitution processes will even increase this tendency. Due to the average shortages at higher levels school-leavers will face not only job-openings in their own occupational domain, but also in the neighbouring occupations. At the lower levels schooleavers will face competition with other types of education for the limited number of available job-openings what will further decrease the prospects.

Besides the empirical results, the paper has shown the methodology in which trends in required and supplied qualification are analysed in the context of a flexible labour market. This methodology should be developed further. Future research will be necessary to improve further the insight we have in substitution processes on the labour market, and to obtain better insight in the trends in required qualifications. Two major lines of resesarch have to be mentioned here. Firstly, it is important to investigate the recruitment behaviour of employers in order to get more insight in the way in which people from different types of education can replace each other. Secondly, it will be interesting to obtain more information about the consequences of shortages and surplusses on the labour market have for the individual worker and the individual firm. Although for the functioning of the labour market it is important that there are sufficient substitution possibilities between categories of labour, in practise this substitution will not be without costs. Employees will face lower wages, and a less secure labour market position due to what has been called a decrease of the labour market position, while employers will face higher wage costs, more difficulties to recruit people or training costs due to possible shortages. These consequences of shifts in employment should be investigated in more detail.

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Concepts and methodology for labour market forecasts by occupation and qualification in the context of a flexible labour market

Summary

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Contribution to workgroup Zero-A of CIRETOQ, 1995

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Introduction

The labour market is constantly changing. Sectors of industry grow while others are shrinking. Some occupations become relatively more important while others decrease in importance, and employers tend to change the requirement in qualifications needed to fulfil these occupations. On the other side of the labour market the supply of workers with a certain qualification limits the recruitment possibilities for employers. On the labour market, therefore, matching processes take place which bring together supply and demand, which constantly have to adjust to the changing circumstances.

The most prominent method to deal with the projection of future imbalences between supply and demand for certain types of education, or qualifications, is the so-called manpower requirement approach. Traditionally this approach assumed that for every occupation a specific type of education exists. Therefore each pair of education and corresponding occupation was treated as a reparate sub-market for which supply and demand could be predicted.

In the paper we show that this assumption of a unique relationship between education and occupation does not hold. We illustrate the actual structure of the Dutch labour market and show how a model for manpower forecasting can be developed which takes the flexibility of the labour market into account. Finally, we show which shifts in demand are expected for the Dutch labour market from 1995 till 2000.

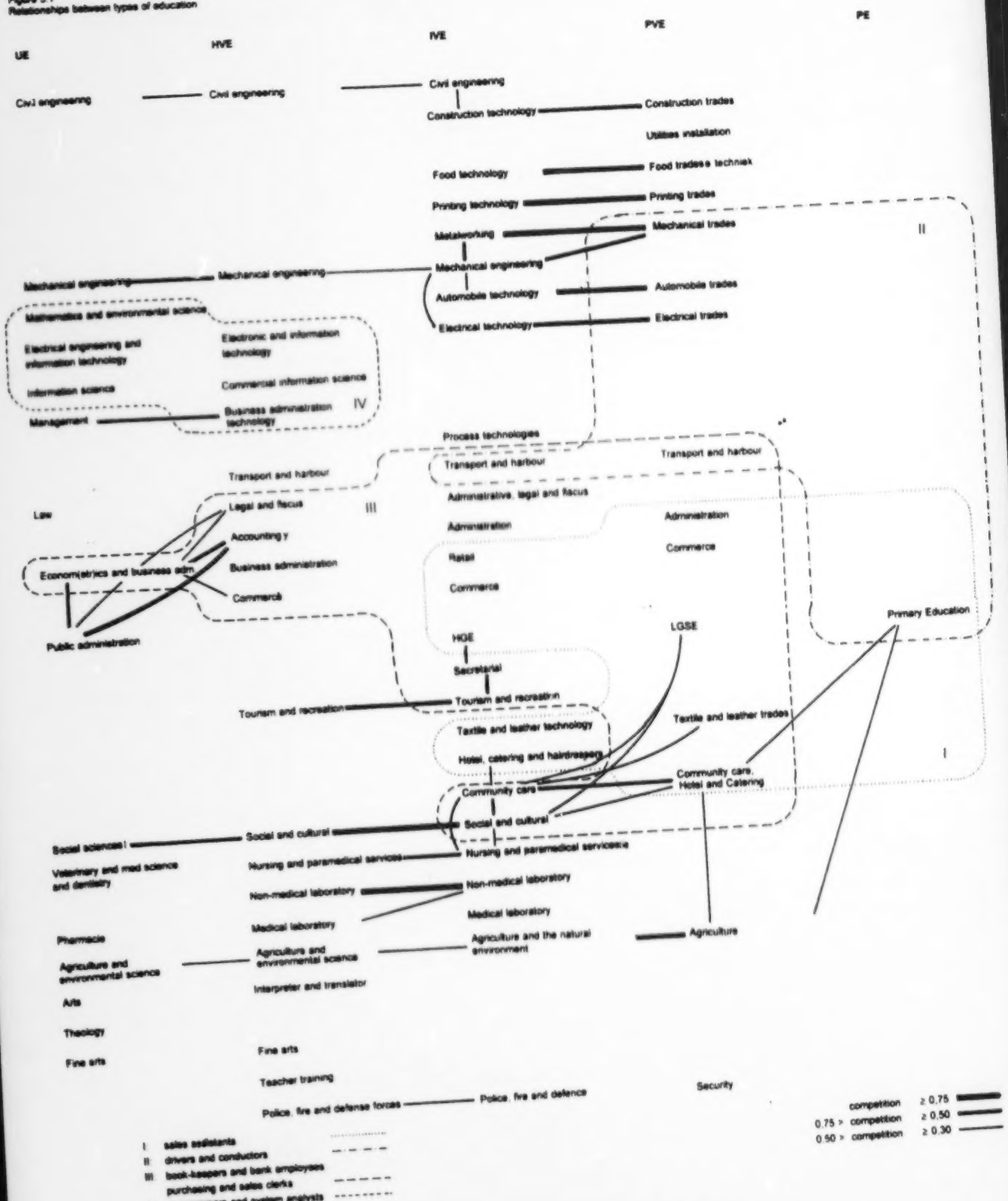
The structure of the labour market

Because workers with a particular educational background can switch to several occupations, and employers can recruit personnel with diverse educational backgrounds for a particular occupation, there may be an overlap in the labour market between the occupational domains of types of education. This overlap is represented here in the form of a *competition index* for each pair of educational types. The closer the value of this index is to 1, the greater are the similarities in the occupational structures of two types of education. If the competition index is 0, on the other hand, there are no occupations in which graduates from both types of education work.

Figure 3.1 gives a schematic overview of the relationships between the types of education which have been distinguished. In principle every overlap in the occupational domain of 0.30 or greater is shown with a line between the domains It was found that a number of occupational groups link very many types of education together. Because this would make it difficult to grasp the overall picture of the structure of the labour market, the relationships between types of education which are related largely via these occupational groups are not indicated separately: rather these types of education have been represented as one cluster.

Due to uncertainties at the labour market, it is beneficial for workers if their educational background or occupation offers many opportunities to switch within the labour market. This makes them less dependent on developments in a particular occupation or a particular economic sector. Employers also run less risk in recruiting personnel if they can recruit from a broad range of types of education. However a strong relationship between the various occupational domains in the labour market is advantageous not only at an individual level, but also for society as a whole. In practice, the overlap in the occupational domains of types of education makes it possible for demand and supply in the labour market to adjust to one-another more easily. This means that a mismatch between demand and supply for particular types of education need not immediately lead to unemployment or unfilled vacancies.

Figure 3.1
Relationships between types of education



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For example, discrepancies between demand and supply also lead to shifts in the occupational structure of employment for workers with a particular educational background. People will find themselves with a different place in the labour market than they might initially have expected. However this adjustment is in general not without negative consequences. Where there is an over-supply of workers with a particular type of education they often have to accept work at a lower level, or outside the field in which they trained. Moreover, these positions are generally less well paid and have more flexible labour contracts. Where there is a supply shortage, the costs of adjustment must be met by the employer. In this situation they are forced to hire people with education of a lower or less appropriate level, as well as having to offer higher wages and better working conditions in order to hold their personnel (Wieling and Borghans, 1995). However these costs of labour market flexibility are generally preferable to the unemployment or hard-to-fill vacancies which result from a more rigid labour market.

Components of demand

Figure 3.1 shows that the occupational domain of different types of education are not strictly separated, but overlap each other. This structure provides flexibility to the labour market structure and makes gradual changes possible. In the paper the empirical results of labour market projections and the model these are based on are described. These forecasts of the labour market by education and occupation predict the labour market changes for the period 1995-2000.

The demand for school-leavers from particular types of education is determined first by changes in the employment in economic sectors. In addition to this *economic sector effect*, there will also be different changes in the employment levels for the various occupational classes within a single economic sector. This *occupational effect* is due to some extent to the heterogeneity of the economic sectors as these are defined, but also to changes in the activities within an economic sector. Moreover, the skills which are demanded in these occupations also change. As the result of these changes, some types of education which are better adapted to the developments in the demand for qualifications will show a positive *education effect*. These three effects combined represent the shifts on the demand side. As a result of discrepancies between the types of education which are in demand and the available supply, there are inevitable shifts in the demand. In that case, employers adjust their desires in accordance with the availability of workers. The latter effect is designated as the *substitution effect*.

Table 5.5 shows the extent to which the demand for labour will change as a result of the economic sector, occupational, educational and substitution effects in the coming five years. These changes in employment levels refer to the net effects per educational level, so that the positive and negative shifts experienced by the various types of education within the same level cancel each-other out. Therefore the last line of the table completes this picture by presenting the sum of the negative and positive effects.

Table 5.5
Components of the changes in employment levels per educational level (net effects), 1995-2000

	sector effect %	occupational effect %	educational effect %	substitution %	total %
Primary education	4.2	-4.2	-13.1	-1.7	-14.8
LGSE, PVE	4.0	-3.1	-5.4	-3.2	-7.7
HGSE/UPE, IVE/app	4.6	-1.0	1.8	-0.7	4.7
HVE	3.7	5.8	4.9	3.8	18.2
UE	3.7	7.1	9.3	7.2	27.3
Total (net)	4.2	0	0	0	4.2
Total (all changes)	4.6	3.6	4.9	2.9	10.6

Source: ROA

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Conclusions

In the paper it has been shown that substitution processes between different types of education play a crucial role in the adjustment of the labour market to changes in supply and demand. The existence of these substitution processes implies that trends in employment should be interpreted carefully. The increase of employment of a certain educational category in an occupation might indicate at both changes in demand and in supply. In the first case — an increase in demand — the labour market situation of the category involved will improve whereas in case of an increase of supply there will be a worsening of the labour market position.

It has been shown that in the Dutch situation many substitution possibilities exist between comparable disciplines in education at subsequential levels. Substitution possibilties between different disciplines can however also not be neglected. Some occupation which form a major contribution to total employment in the Netherlands, recruit people from many different types of education. There will be, in the next five years, a further shift of demand from lower to higher levels of education. Although all levels of education could profit form the growth within sectors of industry, the lowel levels loose demand due to the fact that they are employed in occuption which grow relatively slow a will decrease the next five years. More importantly, employers will more and more require higher qualification levels for their occupation. Most drastically this upgrading process leads to a further decrease in demand for unschooled workers and workers with only a qualification at the lower vocational level.

Taken together, at the lower educational levels supply will excees demand while at the higher educational levels there will be for most types of education sufficiently job openings for all school-leavers who will enter the labour market. Therefore it is expected that the labour market perspectives of many higher types of education are good, while many types of education at lower levels are less satisfying. Substitution processes will even increase this tendency. Due to the average shortages at higher levels school-leavers will face not only job-openings in their own occupational domain, but also in the neighbouring occupations. At the lower levels schooleavers will face competition with other types of education for the limited number of available job-openings what will further decrease the prospects.

Besides the empirical results, the paper has shown the methodology in which trends in required and supplied qualification are analysed in the context of a flexible labour market. This methodology is, however, still in its development phase. Future research will be necessary to improve further the insight we have in substitution processes on the labour market, and to analyse further the trends in required qualifications. Two major lines of resesarch have to be mentioned here. Firstly, it is important to investigate the recruitment behaviour of employers in order to get more insight in the way in which people from different types of education can replace each other. Secondly, it will be interesting to obtain more information about the consequences shortages and surplusses on the labour market have for the individual worker and the individual firm. Although for the functioning of the labour market it is important that there are sufficiently substitution possibilities between categories of labour, in practive these substitutions will not be without costs. Employees will face lower wages, and a less secure labour market position due to what has been called a decrease of the labour market position, while employers will face higher wage costs, more difficulties to recruit people or training costs due to possible shortages. These consequences of shifts in employment should be investigated in more detail.

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